

DataCollector 2e User's Guide



Designed by CPO Science

In conjunction with:

Reinrag East

PRI

EVC

Silvis Consulting



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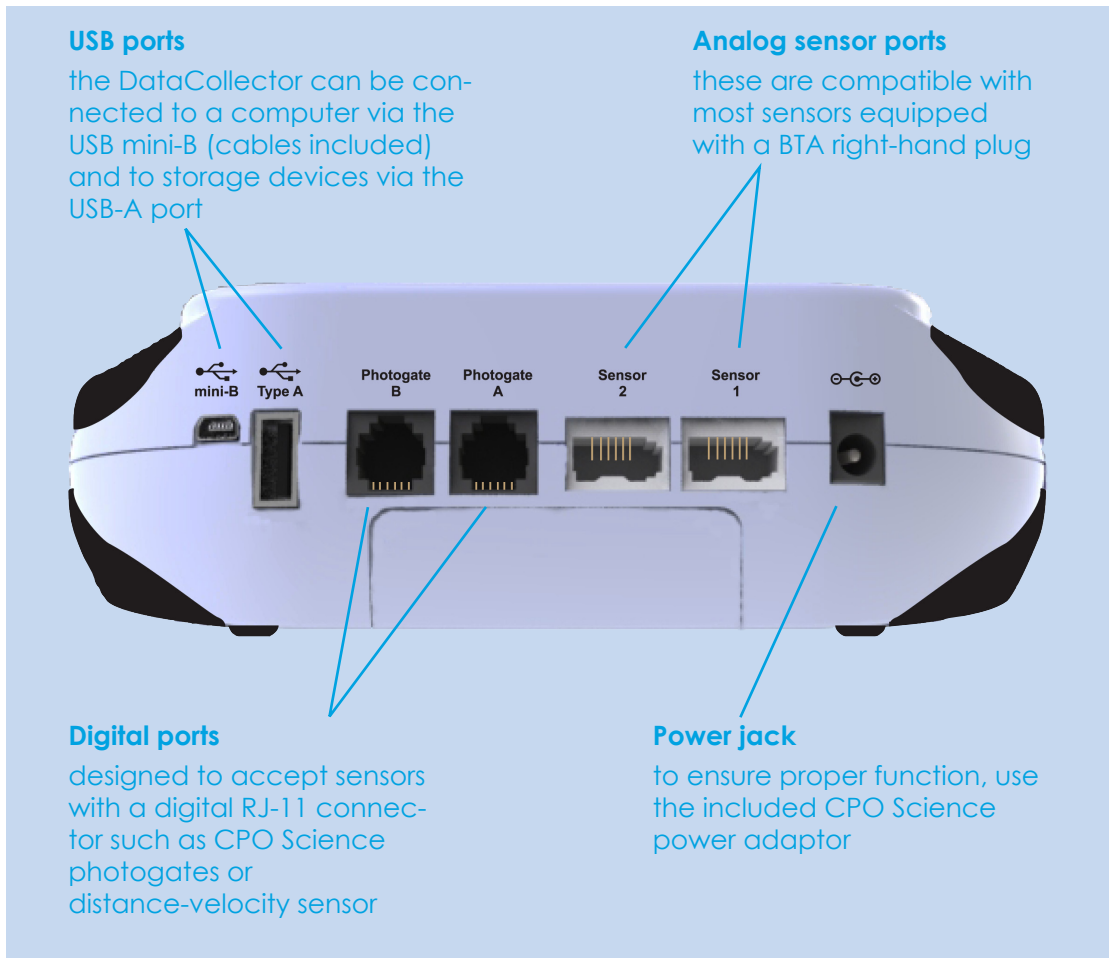
Getting Started

Features of the DataCollector



The CPO Science DataCollector 2e is an intuitive, easy-to use data collection platform. Sensors plug directly into the ports of the DataCollector and the unit's color touch screen displays instant and accurate readings. Data can be collected and saved for later analysis, either on the device or by connecting the DataCollector to a computer.

Identifying the Ports of the DataCollector



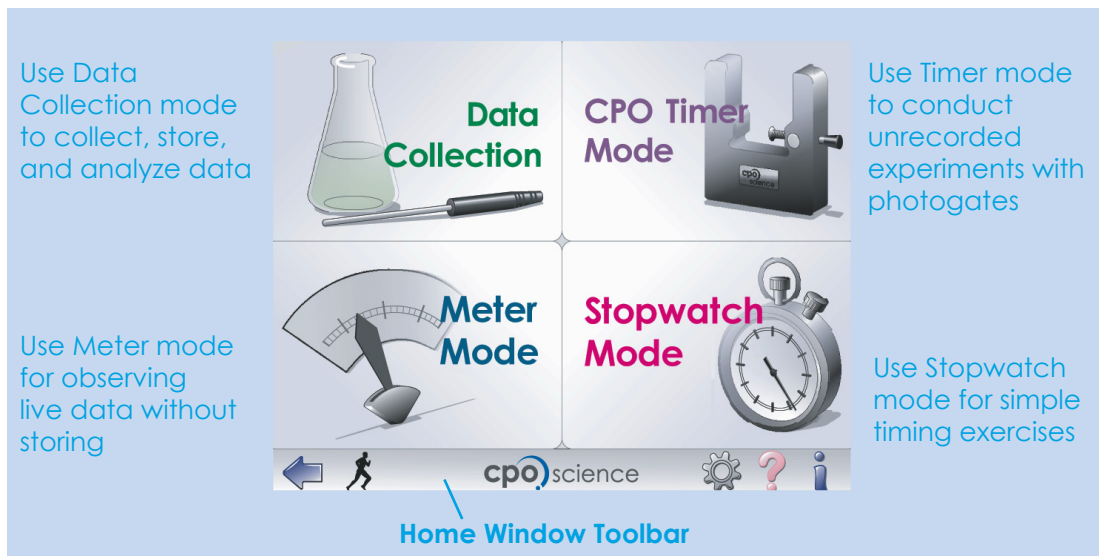
The DataCollector has seven ports on the rear of the enclosure, including four dedicated sensor ports: two photogate or digital RJ-11 ports and two British Telecom analog ports (a common sensor interface). Also present are two USB ports—a mini-B for connecting to a computer and a USB-A port for storage devices—and a power jack.

The DataCollector is designed primarily for use with CPO Science photogates and sensors, but is compatible with a range of sensors from Vernier and Fourier Systems (connector adaptors may be required).

Using the DataCollector

Starting the DataCollector Application

When the DataCollector is powered on, the first screen that appears is called the Home screen. From here, the four main functions of the DataCollector can be accessed.



Also, along the bottom of the screen is the Home Window **Toolbar**. This is used to display and access basic informational features of the DataCollector.



The Device Information screen is very similar to the "About" option in most computer help menus: it displays information such as the DataCollector's serial number and current software version. The help screens can be accessed within any mode of the DataCollector, but the main help window is a good place to start for general assistance. The other features of Device Setup are covered separately on page 14.

Data Collection Mode

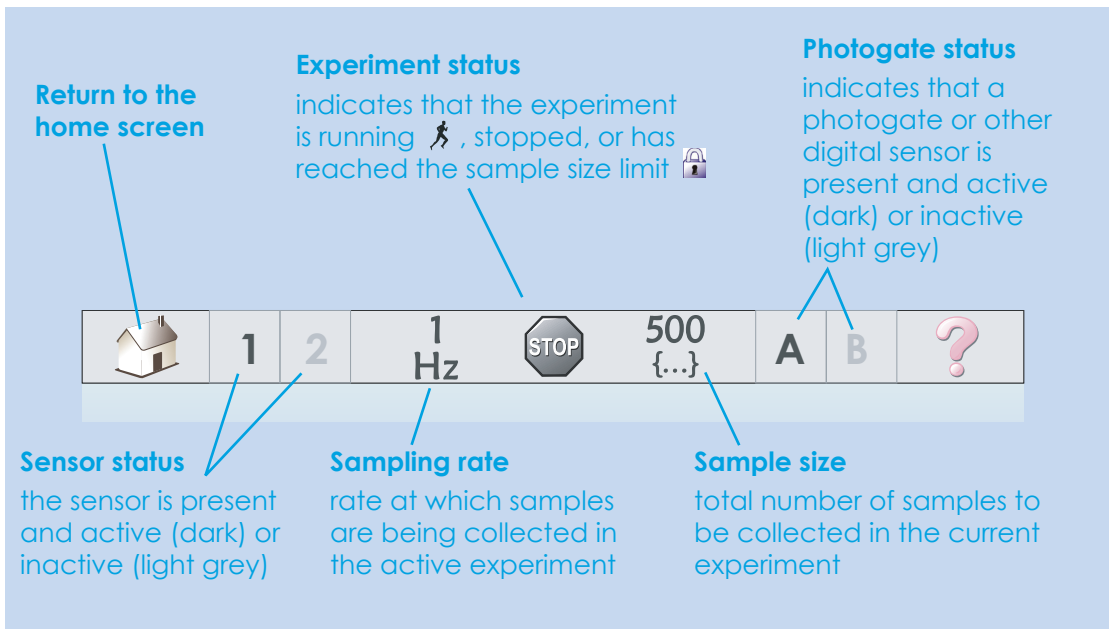
Data Collection Mode is used to collect, record, and analyze data. Selecting Data Collection from the Home Screen brings up the Data Collection window.

Tapping Go! in the center of the screen will start a new experiment with default settings.

Along the bottom are the options to enter experiment setup or to explore old experiments still stored on the DataCollector.



Along the top of the screen is the Status Bar, which displays general information about the experiment as well as access to the home and help screens.



Experiment Setup

Selecting the Setup tab opens the experiment setup screen. From here, the experiment mode, sample size and rate, as well as sensor units can be selected. Sensor inputs can also be deactivated, so that experiments for single sensors can be run without having to detach the sensor from the Data-Collector.

Once the experiment settings are correct, tap Go! to start.

Sample size can be set from 10 – 2000 data points

Sensor inputs can be turned on or off

- S_1 : Analog Sensors
- PG_A : Photogate
- SP_A : Smart Pulley Photogates

Mode: ☒ Standard ☐ Interval

Samples: 500

Rate: 1

S_1 : Pressure

S_2 : Pressure

none

Cancel Reset Go!

Sample rate can be set from 1 – 200 samples per second (Hz) or 2 – 3600 seconds between samples

Many sensors have alternates to the default SI units

Tap to start!

An experiment can also be set up to record several successive interval trials. Simply select the Interval radio button and the desired sample size before beginning.

Display changes to indicate photogate setup

Mode: ☐ Standard ☒ Interval

Samples: 500

PG_A : Interval

PG_B : Interval

PG_{AB} : Interval

Cancel Reset Go!

Sample size can range from 10 to 2000 trials

Meter Window

Once the experiment is begun, the Meter window appears, which displays the readings for the active sensors in the experiment, as well as the elapsed experiment time.

Selecting the view tabs along the bottom of the screen changes the view to a different view window.

The Meter Window displays real-time sensor data and elapsed time. It features a top bar with icons for home, tabs 1 and 2, a frequency of 1 Hz, a running person icon, a value of 500 with a dropdown arrow, and buttons labeled A, B, and a question mark. The main display area shows two temperature readings: T_1 at 30.72 °C and T_2 at 29.14 °C. Below these is a large green bar and a digital clock showing 02:14.32. At the bottom are four view tabs: Meter, Table, Graph, and Setup. Annotations point to the 'Active Sensor Readings' (the temperature values), 'Elapsed experiment time' (the clock), and 'Window tabs' (the bottom navigation bar).

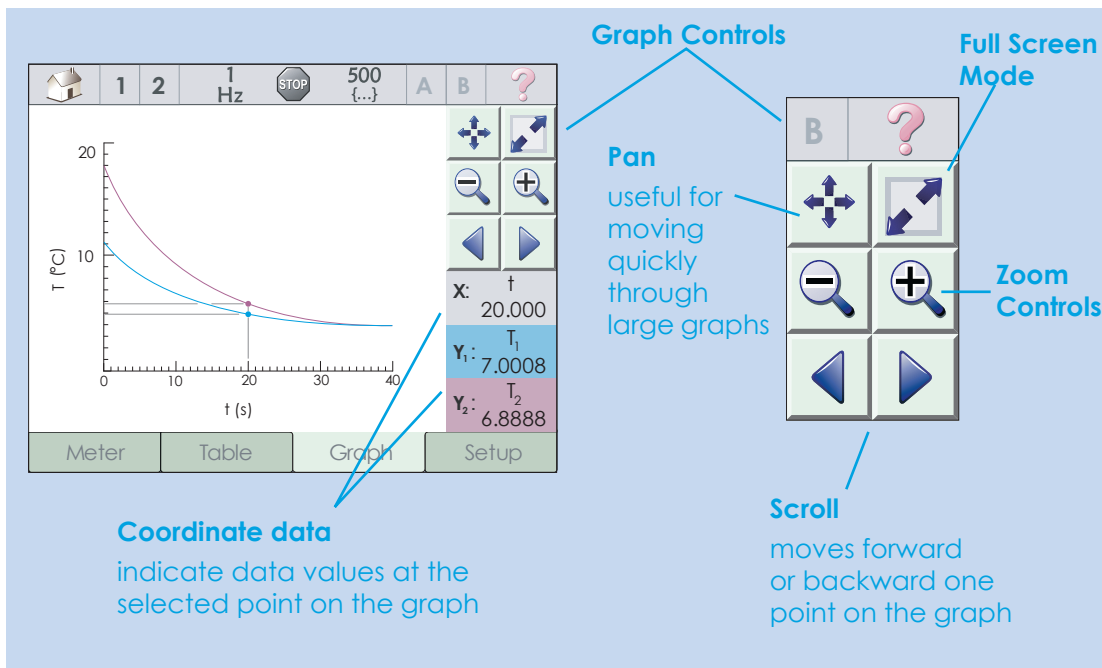
Table Window

The Table window displays the collected data for the active experiment and also allows the sources for the experiment graph to be selected. Up to three data sources can be collected in the data table.

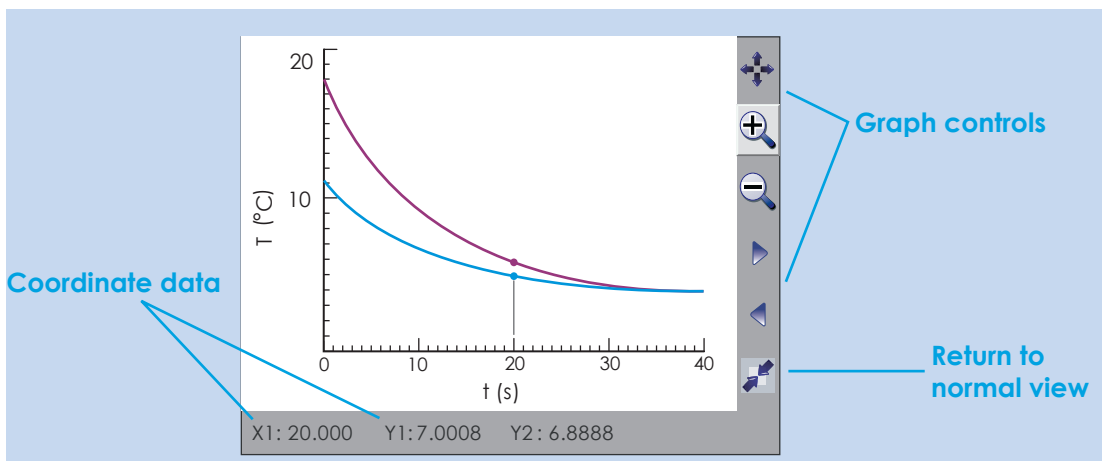
The Table Window displays a table of collected data. The top bar is identical to the Meter window but shows a frequency of 5 Hz and a value of 200 with a dropdown arrow. The table has three columns: time (t in seconds), T_1 in degree C, and T_2 in degree C. The data rows show time intervals from 0.2000 to 1.0000 seconds and corresponding temperature readings. To the right of the table is a vertical scroll bar. At the bottom, there are four view tabs: Meter, Table, Graph, and Setup. Below the table, there are selection buttons for graphing: X, Y_1 , Y_2 , X, Y_1 , Y_2 , X, Y_1 , Y_2 , and X, Y_1 , Y_2 . Annotations point to 'Live data' (the table content), 'Graph source' (the selection buttons), and 'Scroll bar' (the vertical scrollbar).

Graph Window

The DataCollector allows for visual interaction with the experiment data by graphing up to two data sources automatically. Data points can be selected and compared by selecting the desired area with the stylus.

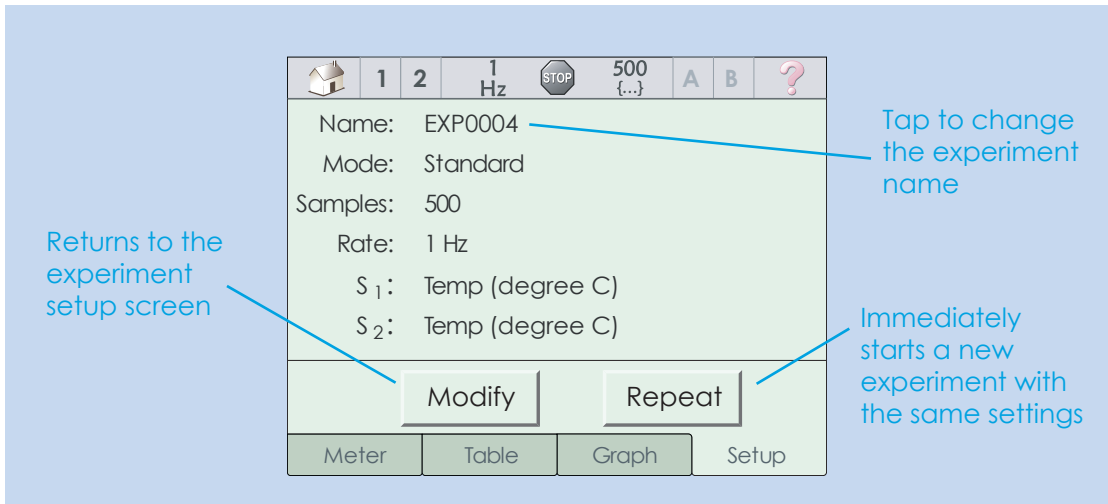


The graph can be expanded to allow for better viewing of the data by entering full screen mode. Graph controls are still readily identifiable and accessible via the side bar.

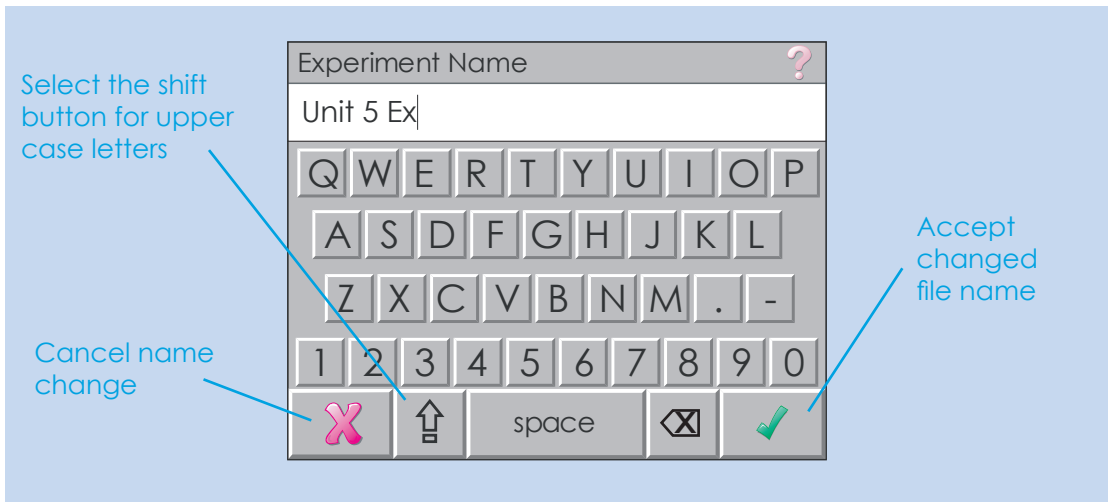


Setup Window

The settings for the active experiment are displayed in the Setup window. From here, the experiment name can be changed or a new experiment started.



Default file names follow the format EXPXXXX and are numbered sequentially. It is a good idea to rename experiments to something more immediately recognizable.



Open Previous Experiments

Experiments that have not yet been downloaded and erased from the DataCollector can be accessed by tapping the Open icon in the lower right corner of the Go! screen.

When an experiment is opened, the features are exactly the same as a live experiment, except that the Meter window is not displayed.

The screenshot shows the 'Experimental History' screen. It features a table with columns: Name, #, f (Sampling rate), and Info. The table lists several experiments, with 'EXP0016' highlighted. Below the table are three buttons: 'Rename', 'Delete', and 'Open'. Annotations point to various elements: 'Number of data points collected' points to the '#' column; 'Sampling rate' points to the ' f ' column; 'Exit to Go! screen' points to a red 'X' icon in the top right; 'Change the name of the highlighted experiment' points to the 'Rename' button; 'Scroll bar' points to a vertical bar on the right side of the table; and 'Lists the sensors used (with corresponding units)' points to the 'Info' column.

Name	#	f	Info
EXP0016	4	$\frac{1}{\text{Hz}}$	P(kPa) T(C)
Gas Law 1	10	$\frac{1}{\text{Hz}}$	P(kPa)
EXP0018	3	$\frac{2}{\text{sec}}$	P(kPa)
EXP0019	15	$\frac{1}{\text{Hz}}$	P(kPa)

Interval and Standard Experiments

Most experiments that will be conducted with the DataCollector will use Standard mode, which involves the collection of data in a continuous series. Examples include experiments to collect data on temperature, pressure, acceleration, and velocity.

Interval mode should be selected for experiments involving series of discrete timed events, such as repeated trials of the Gravity Drop or Energy Car experiments.

Photogate and Smart Pulley

The photogate can be used as a sensor to measure time intervals, or in conjunction with a Smart Pulley—found in the Dynamic Pulleys, Atwood's Machine, Ultimate Pulleys, and Spinner experiments—to directly measure distance, speed or acceleration.

Just select SP_1 or SP_2 in experiment setup to activate this function of the photogate.

CPO Timer Mode

This mode is used to emulate the function of a CPO Science Timer and can be used to conduct experiments with photogates or the CPO Science Sound & Waves machine.

Current function selection

	1	2	Interval	A	B	?
t_A	0.0122	s	0.0099	Memory readings		
t_B	0.0089	s	0.0071			
t_{AB}	0.3255	s	0.2919			
I	f	p	#	0.0	m	Memory function displays a hold value or, in interval mode, the last recorded value
Interval				Reset all values to zero		
Frequency				Count		

The four different functions of CPO Timer Mode can be selected by tapping the symbols along the bottom of the screen.

Interval Function

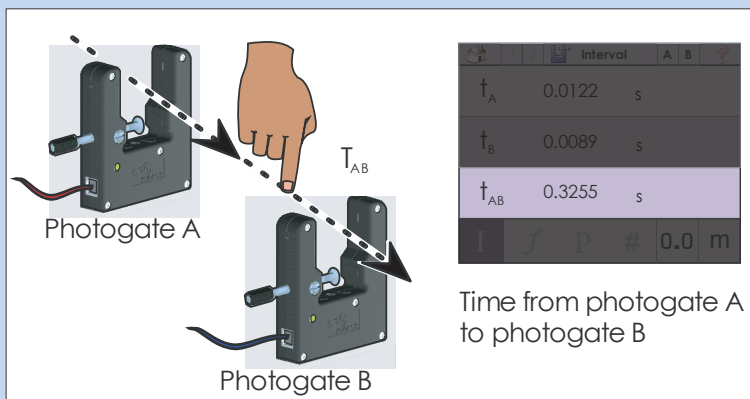
The Interval function uses the photogates to record high-accuracy time intervals. With one or two photogates plugged in, the DataCollector will record the duration that the beam of each photogate is broken—labeled as t_A and t_B —as well as the time elapsed between the breaking of the two photogates. This last value is labeled t_{AB} .

Time through photogate A

Photogate A

Time through photogate B

Photogate B



Frequency Function

The DataCollector is able to measure and display frequencies from 0.1–19,999 Hz, either from the photogates—how often the beam is broken by an object—or from a direct source such as the Sound & Waves machine.

With two photogates attached, the DataCollector displays the difference between the signals (Δf_{AB} , ΔT_{AB} , or ΔN_{AB})

	1	2	Freq.	A	B	?
f_A	9.2500	Hz	3.7500			
f_B	4.7500	Hz	7.5000			
Δf_{AB}	+4.500	Hz	-3.750			
I	f	p	$\#$	0.0	m	

In frequency, period, or count functions, the currently displayed value can be held by tapping the memory icon

Period Function

The period of a connected signal is measured and displayed in seconds. In order to correct for inaccuracies when using a photogate, the period displayed is an average of the previous two breaks of the photogate beam. As a result, the DataCollector will not begin displaying the period until the beam of the photogate has been broken three times.

Count Function

The DataCollector can keep a count of how many times the beam of a photogate is broken, up to a maximum of 19,999.

Meter Mode

Meter Mode is used to observe live data from attached sensors without recording data to an experiment file. Unlike Data Collection Mode, the sensor information is automatically displayed on the screen when it is plugged in.

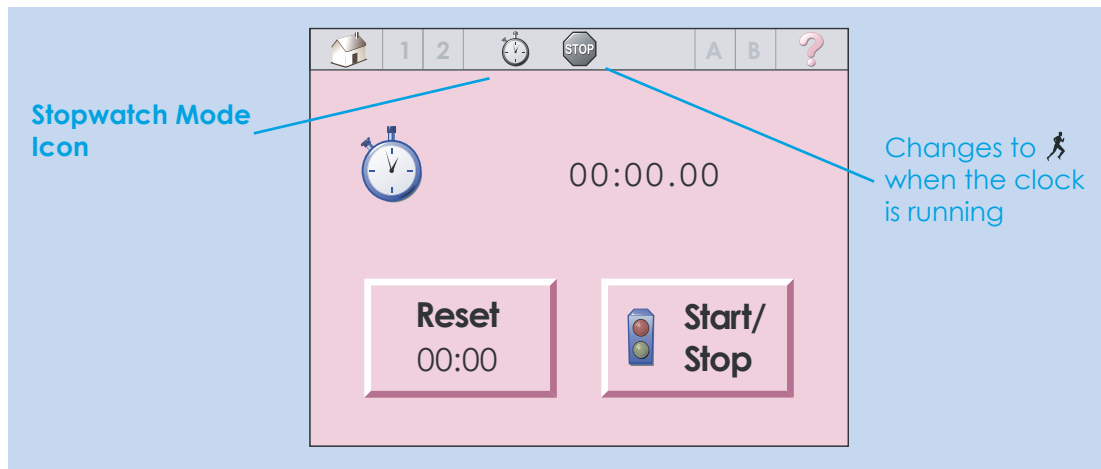
The diagram illustrates the Meter Mode interface, which displays live sensor data and an experiment clock. The interface is divided into several sections:

- Meter Mode Icon:** Located at the top left, it shows a house icon and a running person icon.
- Clock status:** Located at the top right, it shows a question mark icon.
- Sensor Data:** Displays live readings when the experiment clock is running. It shows two sensors: T_1 with a reading of 198.72 and V_2 with a reading of 0.3689.
- Sensor Units:** Displays alternate units, when available, can be selected from the drop-down menu. It shows units 'C' for T_1 and 'V' for V_2 .
- Experiment Clock:** Displays the time elapsed during the experiment, shown as 01:12.44.
- Start/Stop:** A button with a play/pause icon used to start or stop the experiment.
- Reset:** A button with a '0.0' display used to reset the experiment clock.

When the experiment clock is stopped, the last recorded value is displayed in white on a dark blue field. Normal data display resumes when the clock is restarted.

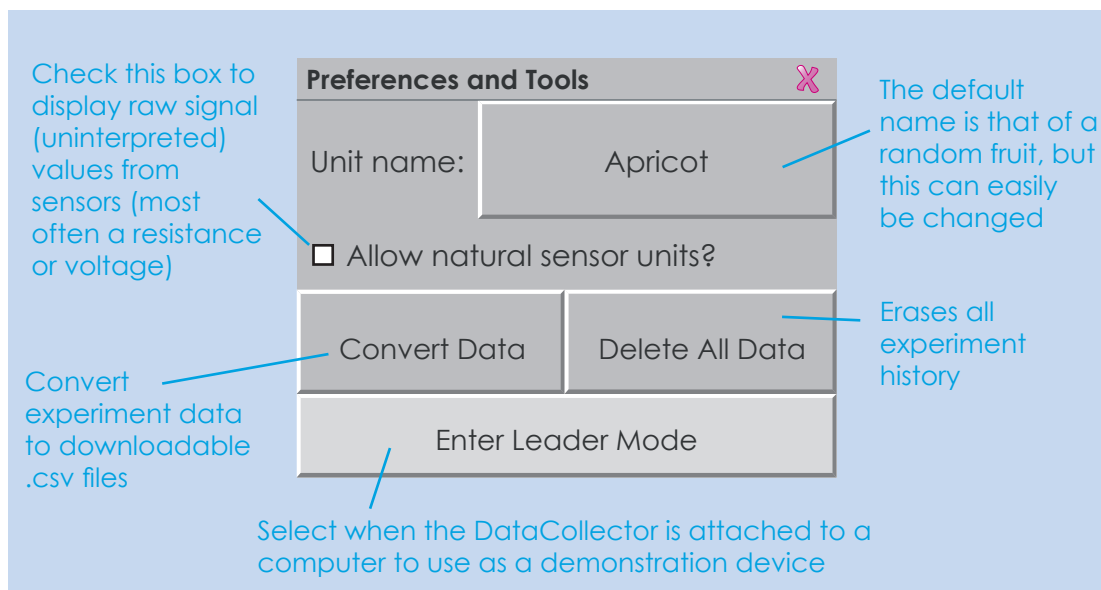
Stopwatch Mode

For use in simple timing experiments, the DataCollector can function as a stopwatch in Stopwatch Mode.



Device Setup

By clicking the icon, some basic features of the DataCollector can be controlled, such as the device name, sensor display, and data management.



Connecting the DataCollector to a Computer

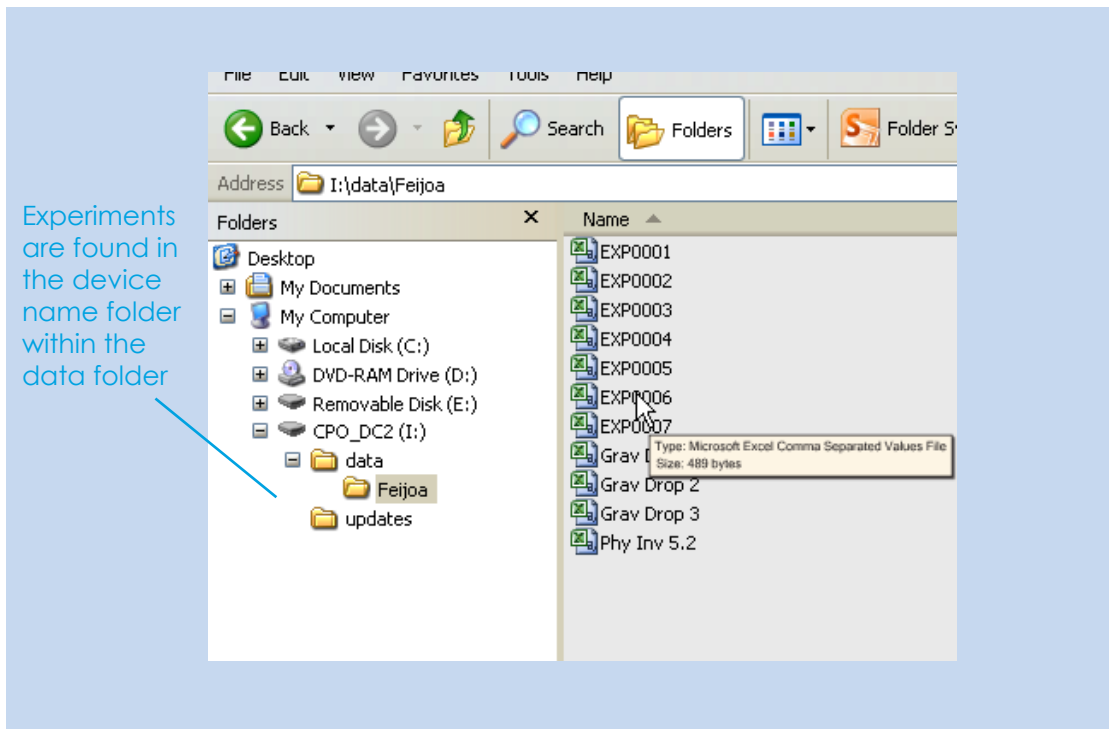
The DataCollector comes with a mini-USB cable that can be used to connect to a computer for transferring data and updating software.

It is important to remember that, when disconnecting the DataCollector from a computer, it is always best to use the *Safely Remove Hardware* (PC) or *Eject Hardware* (Mac) options before physically disconnecting the device.

Transferring and Analyzing Data

Upon completion of an experiment, the data can be saved on the device as comma separated value (.csv) files which can be opened in programs such as Mathworks Matlab, Vernier Logger Lite, or Microsoft Excel.

Attach the DataCollector to a computer and navigate to its drive name (CPO_DC2) in the file explorer. The experiments can be found in the data folder.



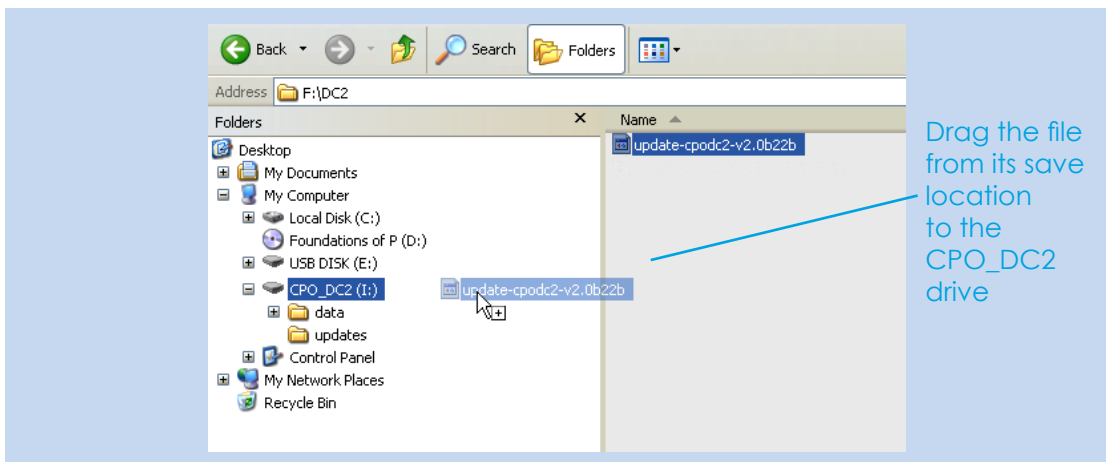
Updating the DataCollector

To learn which software version is currently on the DataCollector, select the device information icon on the Home screen.

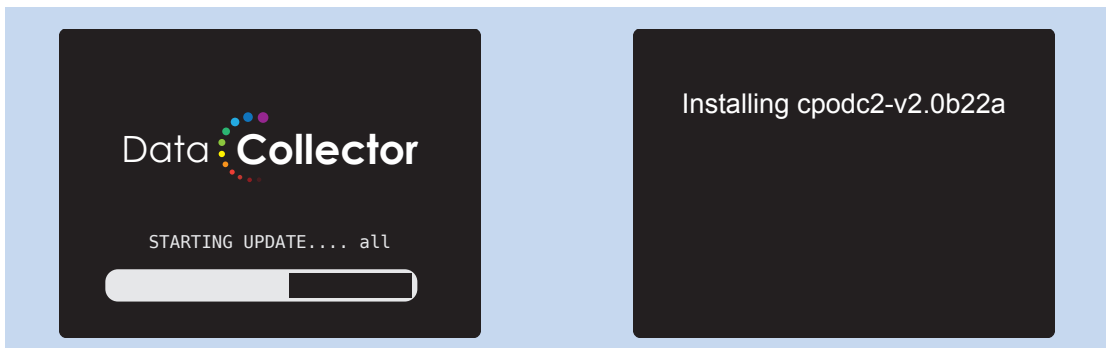
Software updates and support information, including digital copies of product copies of product documentation, are available at:

www.cpo.com/dc-updates

Download the software update by clicking the appropriate link and specifying a location for the file to be saved. To load the the update onto the DataCollector, first ensure that it is powered byt he included 9V adaptor—if a battery were to fail midway through the update, the DataCollector may be rendered inoperable. Connect the DataCollector to the computer on which the file has been saved with the included USB cable. The computer should recognize the DataCollector as a drive named CPO_DC2. Next, simply drag the file from its save location to the DataCollector drive.



Disconnect the DataCollector from the computer first by using the *Safely Remove Hardware* (PC) or *Eject Hardware* (Mac) option and then unplugging the USB cable. The software update will be automatically installed and the update progress will be displayed on the screen.



Warnings and Precautions

Please make note of the following warnings and precautions. Failure to follow these guidelines can result in damage to the DataCollector and in severe cases possible bodily harm.



IMPORTANT: Use only the supplied CPO Science 9V DC adaptor with the DataCollector. That an adaptor can plug into the DataCollector is not a reliable guide to compatibility.



IMPORTANT: Do not over tighten the thumbscrew on the photogates. Overtightening can flex the body of the photogate to the point that the infrared emitter and receiver twist out of alignment, causing the photogate not to return a reading.



IMPORTANT: It is highly suggested that the DataCollector be used primarily with the included 9V power supply when conducting experiments. Longer experiments can quickly drain the battery.



WARNING: Do not plug any lines from the telephone system into the DataCollector's sensor ports. Telephone rings generate large voltages that can damage or destroy the DataCollector.



WARNING: Some computer data cables have the same RJ-11 connectors and appear the same as the cords included with the photogates, but differences in the internal wiring may cause damage to the photogates and the DataCollector.



WARNING: When using the DataCollector, be sure not to exceed the specifications on the voltage sensor, current sensor, or other sensor types that may be used. Doing so can damage both the sensor and DataCollector, as well as cause injury.



WARNING: Be sure to use the 9V power supply with the DataCollector when updating the software on the device. Failure of the battery before completion of the software update may cause the DataCollector to become inoperable.

Warranty Information

CPO Science warrants this instrument against defects in materials and workmanship for a period of one year. Repair and/or replacements authorization can be obtained by contacting CPO Science Customer Care at:

1.800.932.5227
customerservice.cpo@schoolspecialty.com.

CPO Science
80 Northwest Blvd.
Nashua, NH 03063

Technical support and product FAQs can be accessed at www.cpo.com/techsupport. Be sure to fill out the warranty card that came with your kit or register online to receive notification of software updates.

